Managing the Back End of the Nuclear Fuel Cycle

Presentation of

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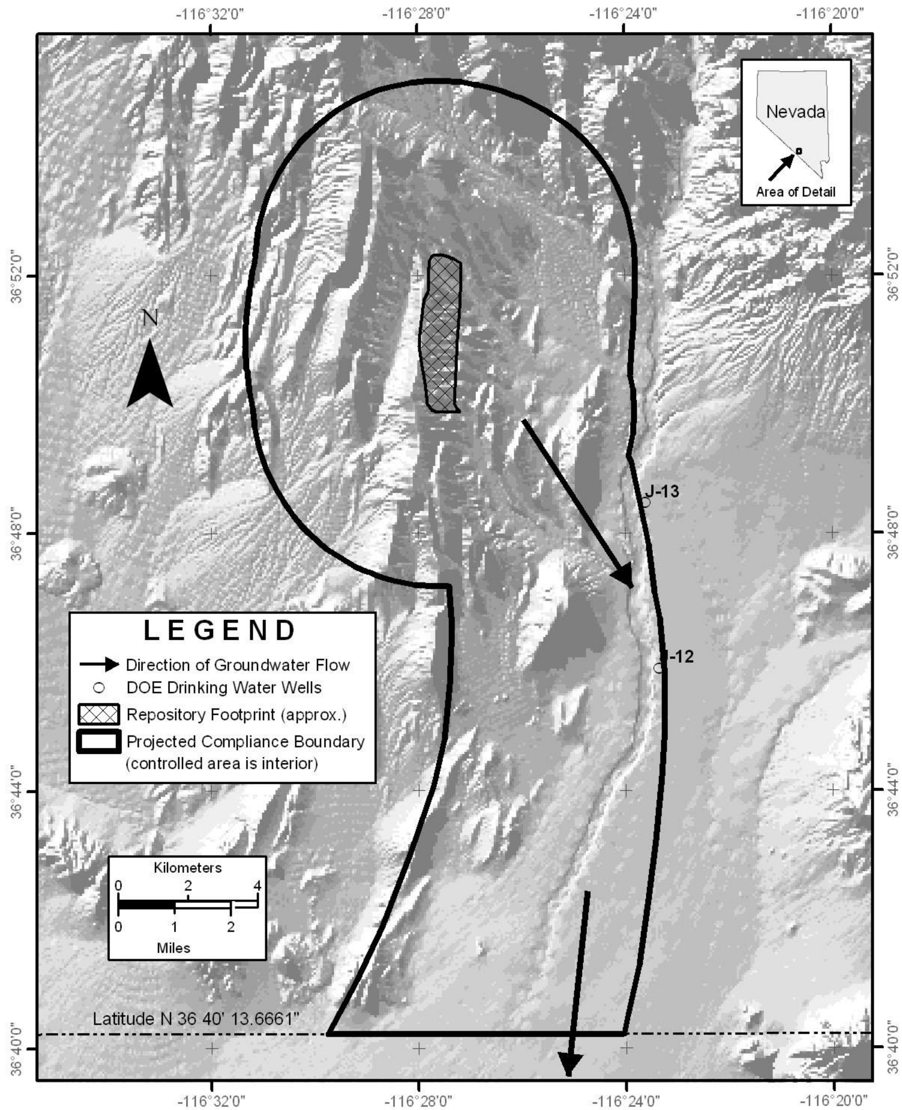
Focus of this presentation

- The Commission is not balanced as required by the Federal Advisory Committee Act (FACA).
- The Commission's priority focus should be on getting the geologic repository program back on track.
- There is a need for a new spent power reactor fuel storage policy that ends the practice of dense compaction of spent fuel assemblies in wet pools, and moves spent fuel into interim hardened dry cask storage.
- The single-pass plutonium recycle fuel cycle as practiced in France should not be adopted by the United States.
- The Commission should oppose investing significant federal resources in a futile attempt to develop uneconomical closed fuel cycles, advanced reprocessing technologies and fast reactors, and instead recommend that the substantial ongoing research efforts be redirected to develop non-nuclear technologies that are more likely to mitigate climate change sooner and at lower cost.

Projected Groundwater Standards Compliance Boundary for Spread of Radioactive Contamination at the Yucca Mountain Project

Measurement of Radioactive Contamination Takes Place Outside of Controlled Area



NRDC produced this visual representation from the following information:
"The controlled area may extend no more than 5 km in any direction from the repository footprint, except in the direction of groundwater flow. In the direction of groundwater flow, the controlled area may extend no farther south than latitude 36 40' 13.6661" North ... [T]he size of the controlled area may not exceed 300 square km." 66 Fed Reg. at 32117 (June 13, 2001). The direction of groundwater flow is from FEIS (February 2002) at 5-21, Figure 5-3. The repository footprint is from the Yucca Mountain Science and Engineering Report, DOE/RW-0539, at 1-17, Figure 1-3, and the area is approximately 4.27 square km. The area within the projected compliance boundary, as shown in this map, is about 230 square km. The relief image was created from a 1 arc-second Digital Elevation Model from the USGS National Elevation Dataset, April 2002. This map is based on a Nevada State Plane Central projection, North American Datum 1927.

Nuclear Fuel Cycle Options

- 1) Once-through cycle
- 2) Single-pass recycle in thermal reactors
  (the French/Areva option)
- 3) Balanced closed cycle with
  transmutation in fast reactors
  (the GNEP vision)

Dry Cask Central Storage

- Consolidated central storage of spent fuel from shut down reactors makes sense.

- Consolidated storage of spent fuel from operating reactors does not make sense.

Maine Yankee Dry Cask Storage Installation

Ahaus Spent Fuel Storage Facility

Why separate plutonium?

- USG has 34 tonnes of excess weapon-grade plutonium; it cannot give it away; separated Pu has a negative economic value for energy use

- To get Pu for one MOX assembly, one needs to reprocess 7-8 spent LEU fuel assemblies

- Even taking credit for recovery of unused uranium, a MOX assembly will cost several times (MIT-2003 estimate is >4 times) the cost of a fresh LEU assembly

Single-pass Recycle

- Reduces uranium mining requirements ~20-25%
- But at great cost
- We could also reduce uranium requirements by operating enrichment plants at very low tails assay; also at great cost and consequently an equally dumb idea
- Better strategy is to minimize the cost of the fuel cycle

Single-Pass Recycle is the Wrong Strategy

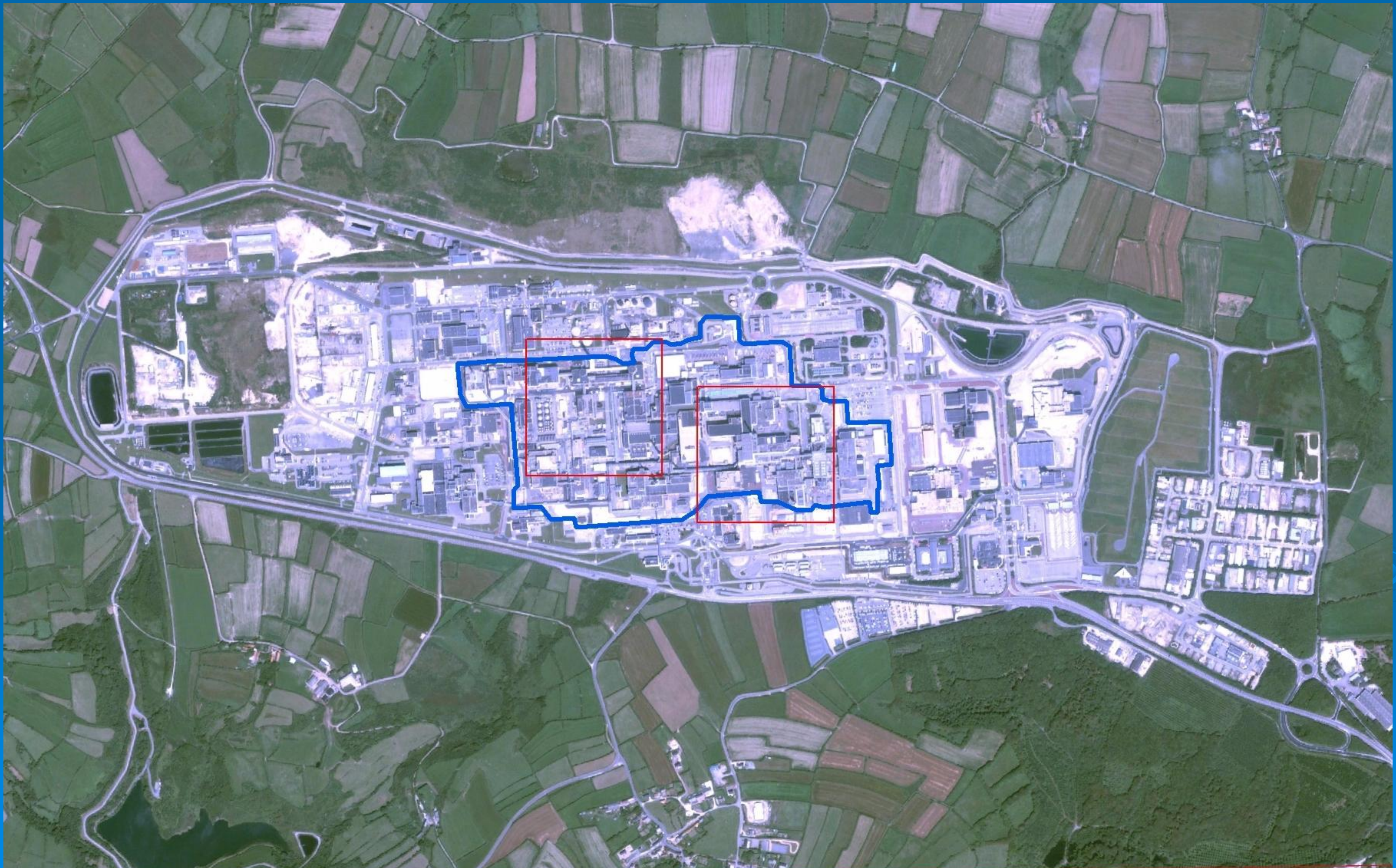
- Proliferation risks associated with plutonium separation in non-weapon states of concern
- High costs; massive federal subsidies
- No significant reduction in repository requirements
- Greater safety and environmental risks
- Greater inventories of intermediate and low-level radioactive waste to manage
- Greater decommissioning costs and disposal concerns

Area required for dry cask storage of 60,000 t spent fuel:

one red square (60,000 t SF / 0.5 t SF/m^2 = 120,000 m^2)

La Hague Complex – chemical processing area:

blue polygon (~373,000 m^2)



Conclusion

If one advocates single-pass recycle and storing spent MOX fuel indefinitely,

a better strategy is to:

- Store spent fuel;
- Postpone reprocessing until recycle is clearly economical (which will not happen any time soon)
- Defer major closed cycle R&D commitments until the international control regime can provide adequate safeguards (which is clearly not the case today).

History has not been kind to fast reactors

- Fast reactors currently **cost considerably more** than thermal reactors, and seem likely to stay that way.

- Commercial/naval fast reactor development **programs failed** in the: 1) United States; 2) France; 3) United Kingdom; 4) West Germany; 5) Italy; 6) Japan; 7) Russia 8) U.S. Navy and 9) the Soviet Navy; and the program in India is showing no signs of success. The Soviet Union/Russia never closed the fuel cycle and never fueled its fast reactors with MOX. China is starting a fast reactor development program.

- After spending tens of billions of dollars on fast reactor development there is **only one** operational commercial-size fast reactor out of about 439 operational power reactors worldwide and even this one (BN-600 in Russia) is not fueled with plutonium

- Fast reactors have proven to be **less reliable** than thermal reactors

The wide spread use of fast reactors and a closed fuel cycle to burn selective actinides for waste management purposes has essentially no chance of succeeding within any policy time frame that is relevant to resolving either current nuclear waste storage issues or the problem of de-carbonizing the U.S. electric power generation sector.

Continued U.S. research and development on advanced reprocessing will fan global interest in plutonium separation and utilization technology and thereby increase nuclear weapons proliferation risks.

END